Precalc Warm Up # 12-2

Solve. Give exact answers if possible. Do not use logarithms:

1. $8^x + 3 = 7$

2. $4^x = \frac{1}{32}$

3. $2^x = 20$
(hint: graph it!)

4. $(x^2 - 5)^{x+5} = 1$

4. $(x^2 - 5)^{x+5} = 1$

EXERCISES 7.1.2 p. 203

1. Solve the following equations.

(b) $\left\{x \mid 7^x = \frac{1}{49}\right\}$

(e) $\{x \mid 3^{x-2} = 81\}$

(h) $\{x \mid 4^{2x+1} = 128\}$

2. Solve the following equations.

(b) $\left\{x \mid 8^x = \frac{1}{4}\right\}$

(e) $\{x \mid 2^{4x-1} = 1\}$

(h) $\{x \mid 4^{-x} = 32\sqrt{2}\}$

$2^{2(-x)} = 2^5 \cdot 2^{\frac{1}{2}}$

$2^{-2x} = 2^{11/2}$

$-2x = \frac{11}{2}$

p. 204

1. Solve the following for the unknown

(b) $4^{x+1} = 8^{2x-4}$

(e) $16^{2x-1} = 8^{2x+1}$ → $2^{4(2x-1)} = 2^{3(2x+1)}$

(h) $8^x = \dfrac{1}{16^{x+1}}$

2. Solve for the unknown

(b) $8^{x+1} = 2^{x^2-1}$

(e) $6^{\sqrt{n^2-3n}} = 36$ ← 6^2

$(\sqrt{n^2-3n})^2 = (2)^2$

$n^2 - 3n - 4 = 0$

⋮

3. Solve the following

(a) $(x^2 - x - 1)^{x^2} = x^2 - x - 1$

$0^{\text{any pos \#}} = 0$

$x^2 - x - 1 = 0$

$x = \frac{1 \pm \sqrt{1 - 4(-1)}}{2}$

$x = \frac{1 \pm \sqrt{5}}{2}$

(b) $(x - 2)^{x^2 - x - 12} = 1$

(c) $(3x-4)^{2x^2} = (3x-4)^{5x-2}$

$2x^2 = 5x-2$

$2x^2-5x+2=0$

$(2x-1)(x-2)=0$

$x = \frac{1}{2}, 2$

Check $x = \frac{1}{2}$

$\left(3\left(\frac{1}{2}\right)-4\right)^{2\left(\frac{1}{2}\right)^2}$

$\frac{3}{2}-\frac{8}{2}$

$\left(-\frac{5}{2}\right)^{1/2}$

$\sqrt{-\frac{5}{2}}$!!

$0^{\text{Any \#}>0} = 0^{\text{Another \#}>0}$

$3x-4=0$

$x=\frac{4}{3}$

Check for positive exponents:

$2\left(\frac{4}{3}\right)^2$ ✓ $\quad 5\left(\frac{4}{3}\right)-2$

$\frac{20}{3}-\frac{6}{3}$ ✓

(d) $|x|^{x^2-2x} = 1$

(e) $(x^2+x-57)^{3x^2+3} = (x^2+x-57)^{10x}$

$3x^2+3 = 10x$

$3x^2-10x+3=0$

$(3x-1)(x-3)=0$

$x=\frac{1}{3}, 3$

Any# $^{\text{Any other #}} = 1$

$x^2+x-57=1$

$x^2+x-58=0$

$x=\frac{-1\pm\sqrt{1-4(1)(-58)}}{2}$

$x=-\frac{1}{2}\pm\frac{\sqrt{233}}{2}$

Any# $^{\text{Any other #}>0} = 0$

$x^2+x-57=0$

$x=\frac{-1\pm\sqrt{1-4(-57)}}{2}$

$x=-\frac{1}{2}\pm\frac{\sqrt{229}}{2}$, but $10(-\#)$ to $-$ ≠

$x=-\frac{1}{2}+\frac{\sqrt{229}}{2}$

≈ 7.07

$(-1)^{\text{even}} = (-1)^{\text{other even}}$

$(-1)^{\text{odd}} = (-1)^{\text{odd}}$

$x^2+x-57=-1$

$x^2+x-56=0$

$(x+8)(x-7)=0$

$x=-8, 7$

$x=7$

Check powers:

$x=-8$ $\quad 3(-8)^2+3 \neq 10(-8)$

$195 \quad -80$

odd ≠ even

$x=7$ $\quad 3(7)^2+3 \neq 10(7)$ ✓

150 $\quad$ 70

even $\quad$ even

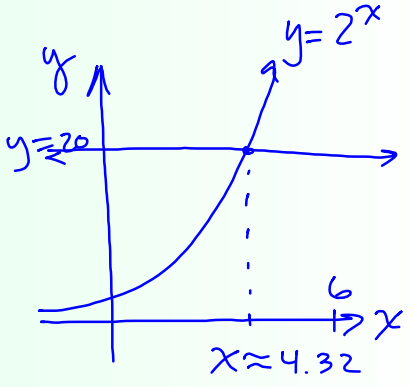
What if the base can't be made the same?

We could graph...

from the warm up: $2^x = 20$

Graph $y = 2^x$ } find the

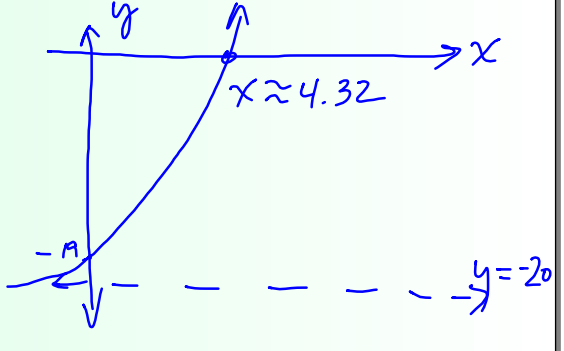
$y = 20$ } intersections



OR

Graph $y = 2^x - 20$

and look for the zeros



What is e?

Leonhard
Euler
1706 - 1783

$$e = \lim_{x \to \infty} \left(1 + \frac{1}{x}\right)^x$$

x	
$\neq 0$	
1	2
2	$\left(\frac{3}{2}\right)^2 = \frac{9}{4}$
10	≈ 2.5937
100	≈ 2.7048
500	≈ 2.7156
1000	≈ 2.7169
2000	≈ 2.7176
10,000	≈ 2.7181
20,000	≈ 2.7182

$e^1 \approx 2.718$

You can often use logarithms to solve for x when x is in the exponent. Some problems are only possible to solve with the graphing method. Sometimes logarithms will work but other methods are quicker.

Ex: $e^{2x+9} = \frac{1}{e}$

$e^{2x+9} = e^{-1}$

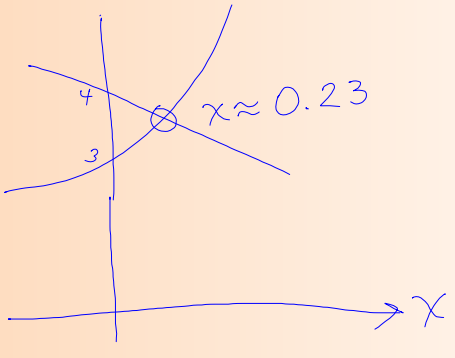
$e^{2x+9} = e^{-1}$

$2x+9 = -1$

$2x = -10$

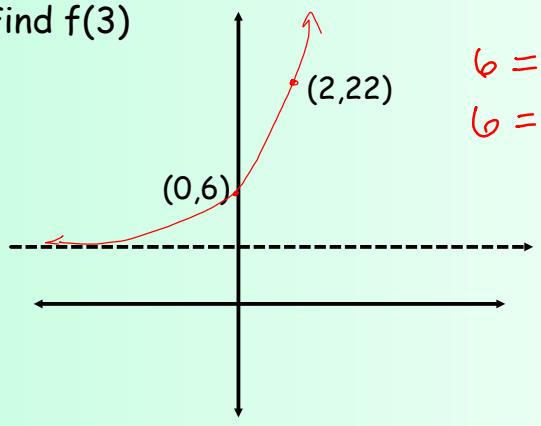
$\boxed{x = -5}$

Ex: $3e^x = -x + 4$



Groups, try this one:

The exponential graph $f(x) = a(3)^x + b$ is graphed below.
Find f(3)



$6 = a(3)^0 + b$ $\quad 22 = a(3)^2 + b$

$6 = a + b$ $\quad 22 = 9a + b$

$-(6 = a + b)$

$16 = 8a$

$a = 2$

$b = 4$

$f(x) = 2(3)^x + 4$

$f(3) = 2(3)^3 + 4$

$f(3) = 58$

HW: SL Book

p. 206 #1ai, 2e

p. 208 #1-7 (b only on these),
and # 8, 9, 10

Do not use logarithms on any of these!!!!!!!